

Application Serial No.: 10/500,635
Attorney Docket No.: 2156-340A

Examiner: J. Zimmerman
Art Unit: 2854

REMARKS

Claims 1-17 and 19-28 are currently pending in the present application and claims 1, 7, 8, 11 and 28 have been amended.

Rejections Under 35 U.S.C. §112

Claims 1-29 stand rejected under 35 U.S.C. § 112, first paragraph because the newly cited limitation in the independent claims that the photoinitiator be an acylphosphine photoinitiator could not be found in the disclosure.

In response, Applicants have amended the amended claims to remove reference to the particular photoinitiator. Based thereon, reconsideration and withdrawal of the rejection of claims 1-29 for failing to comply with the written description requirement is respectfully requested.

Rejection Under 35 U.S.C. §103(a)

Claims 1-2, 5-13, 15-16 and 19-29 stand rejected under 35 U.S.C. §103(a) as being unpatentable over Kuczynski in view of Teng and Applicants' Admitted Prior Art (AAPA).

The Examiner asserts that Kuczynski describes a method for producing a flexographic printing plate which has a base layer and a layer of a light sensitive material attached to the base layer that describes all of the features of the claimed invention except that the laser light has a wavelength of 390 to 410 nm and uses Teng to cure the deficiencies of Kuczynski. The Examiner asserts that Teng disclose that the violet laser diodes having a wavelength of 405 nm are preferred because they have lower cost. The Examiner concludes that it would have been obvious to use a bunch of violet laser diodes in the method of Kuczynski in order to have a lower cost method with a higher throughput as taught by Teng.

Applicants respectfully disagree.

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Firstly, Kuczynski is directed to methods of making flexographic printing plates using a photopolymer layer that is made with a base of styrene-isoprene-styrene and a photoinitiator. As set forth in ¶[0149], the photopolymer layer contains HDDA and HDDMA, which as described in ¶[0065] are activated by UV light. In addition, as evidenced by the attached Technical Brochure from the manufacturer, Irgacure 651® type photoinitiator which is described as being the photoinitiator in the photopolymer layer (see ¶[0149]) of Kuczynski, is a photoinitiator that is used for UV curing. Thus, it is respectfully submitted that Kuczynski describes a photopolymer layer that is curable using UV light. One skilled in the art would not be motivated to look to Teng for its teaching of a violet diode laser because it would not be capable of curing the photopolymer layer described in Kuczynski. In addition, claims 1 and 28 have been amended to affirmatively recite that the photoinitiator is sensitive to the laser light at the wavelength of the laser, in order to further distinguish the claimed invention over the prior art of record.

In addition, Applicants have also amended claims 1 and 28 to recite that the layer of light sensitive material is swept with laser light to produce crosslinked zones in the layer of light sensitive material without the use of a mask. Applicants respectfully submit that Kuczynski discloses that UV irradiation of the printing plate can be accomplished by standard or digital means, which would inherently mean that it is accomplished using a negative or mask (i.e., standard means) or through an *in situ* mask on the surface (i.e., digital means). Thus, Kuczynski, alone or in combination with Teng, does not describe or suggest directly crosslinking zones of the layer of light sensitive material to create an image in the layer of the light sensitive material without the use of a mask.

As to claims 6-8, Applicants respectfully submit that the teachings of Kuczynski referenced by the Examiner relate to complementary crosslinking systems for the compressible layer and not to complementary crosslinking systems for the photopolymer layer on top of the compressible layer in which the image is created. Kuczynski does not

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describe or suggest that the photopolymer layer in which the image is created has complementary crosslinking systems, but only that the compressible layer has complementary crosslinking systems. This is evidenced by at least ¶¶[0190]-[0192] in which Kuczynski discloses that the printing plate can be hardened at a later time to harden the compressible layer. Thus, Kuczynski uses the complementary crosslinking systems to change the properties of the compressible layer but not describe or suggest that it is desirable to change the properties of the photopolymer layer in which the image is created as described and claimed in the present invention and there is no teaching or suggestion in Kuczynski or in Teng that the imageable layer itself has at least two complementary systems as asserted by the Examiner. For these reasons, claims 6-8 are believed to distinguish over Kuczynski in view of Teng and AAPA.

As to claim 11, Applicants respectfully disagree that ¶[0070] of Kuczynski demonstrates the feature asserted by Examiner. There is no disclosure in this paragraph regarding pre-sensitizing the photo-polymer with a flash of light before writing an image with the laser light. Therefore, it cannot be shown that Kuczynski describes or suggests this feature of the claimed invention.

For all of these reasons claims 1-2, 5-13, 15-16 and 19-29 are believed to distinguish over Kuczynski in view of Teng and AAPA and notice to that effect is earnestly solicited.

Claims 3 and 4 stand rejected under 35 U.S.C. §103(a) as being unpatentable over Kuczynski, Teng and AAPA and further in view of Cohen.

Because claims 1-2, 5-13, 15-16 and 19-29 are believed to be allowable over the prior art of record for the reasons provided above, claims 3 and 4 which depend therefrom are also believed to be allowable over the prior art of record and notice to that effect is earnestly solicited.

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Claim 14 stands rejected under 35 U.S.C. §103(a) as being unpatentable over Kuczynski, Teng and AAPA and further in view of Robinson.

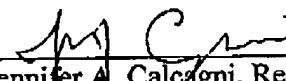
Because claims 1-2, 5-13, 15-16 and 19-29 are believed to be allowable over the prior art of record for the reasons provided above, claim 14, which depends therefrom is also believed to be allowable over the prior art of record and notice to that effect is earnestly solicited.

CONCLUSION

Applicants believe that the foregoing is a full and complete response to the Office Action of record. Accordingly, an early and favorable reconsideration of the rejection of the claims is requested. Applicants believe that claims 1-17 and 19-29 are now in condition for allowance and an indication of allowability and an early Notice of Allowance of all of the claims is respectfully requested.

If the Examiner feels that a telephonic interview would be helpful, he is requested to call the undersigned at (203) 575-2648 prior to issuance of the first Office action.

Respectfully submitted,


Jennifer A. Calcagni, Reg. No. 50,207
Carmody & Torrance LLP
50 Leavenworth Street
P.O. Box 1110
Waterbury, CT 06721-1110
Telephone: (203) 575-2648
Facsimile: (203) 575-2600

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sulfuric acid and that Hongo discloses that the concentration of the copper sulfate in the pretreatment solution provides for higher throwing power and coating uniformity.

Next, the Examiner asserts that Mishima discloses a process for electrolytically plating copper which includes contacting the surface with a pretreatment solution comprising a sulfur containing organic compound and discloses the advantage of contacting the surface with a sulfur containing organic compound is to provide a thin film of the organic substance and/or sulfur compound on the substrate surface.

The Examiner further asserts that Sonoda describes a process for electrolytically plating copper on a surface using an aldehyde as a brightener compound and asserts that the application of brightener compounds in electroplating solutions is a well known and conventional technique used to give a brightened look to the plated product.

Finally, the Examiner asserts that Proell describes a process for electrolytically plating copper and discloses that it is "ordinarily desirable" to maintain free alkanesulfonic acid in the copper plating baths and describes a plating solution comprising alkanesulfonic acid at a concentration of between 5 and 50 grams per liter.

The key to supporting any rejection under 35 U.S.C. 103 is the clear articulation of the reason(s) why the claimed invention would have been obvious. The Supreme Court in *KSR International Co. v. Teleflex Inc.*, 550 U.S. 398, 82 USPQ2d 1385 (2007) noted that the analysis supporting a rejection under 35 U.S.C. 103 should be made explicit. The Federal Circuit has stated that "rejections on obviousness cannot be sustained with mere conclusory statements; instead, there must be some articulated reasoning with some rational underpinning to support the legal conclusion of obviousness." *In re Kahn*, 441 F.3d 977, 988, 78 USPQ2d 1329, 1336 (Fed. Cir. 2006).

Appellants respectfully submit that the Examiner has not provided a clear articulation of the reasons why the claimed invention would have been obvious over the

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prior art of record but has only provided conclusory statements taken from individual references and has also not demonstrated a *prima facie* case of obviousness regarding the present invention.

Firstly, the Examiner concludes that it would have been obvious to modify the process for electrolytically plating copper on a surface as disclosed by Barstad to include contacting the surface with a pretreatment solution comprising a certain concentration of copper ions and sulfuric acid, as disclosed by Hongo, because the pretreatment solution of Hongo provides for higher throwing power and coating uniformity.

Appellants respectfully disagree that it would be obvious to modify the process for electrolytically plating copper described by Barstad by using the pretreatment solution described in Hongo. In particular, the first plating solution described by Hongo (asserted by the Examiner to be equivalent to Appellants' pretreatment solution) is remarkably similar to the electrolytic copper plating solution described by Barstad (see at least examples 1-3 of Barstad). Thus, one skilled in the art would be motivated to use a first plating solution (described by Hongo) followed by the substantially similar second plating solution described by Barstad because both plating solutions are substantially similar to each other in both composition and concentration of ingredients. Moreover, Hongo describes the use of two different plating solutions that use different concentration of the copper sulfate and sulfuric acid to produce plating deposits with different properties. Appellants respectfully submit that the modification of Barstad with the first plating solution of Hongo would only produce two plating deposits and not two deposits with different properties. Thus, there is no suggestion as to why one skilled in the art would be motivated to use the first plating solution of Hongo in the process of Barstad as the first plating solution would not provide any different result that is already being achieved with the plating solution described in Barstad.

The Examiner further concludes that it also would have been obvious to substitute the sulfuric acid in the pretreatment solution of Hongo with the sulfur containing organic

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acid taught by Mishima to provide a thin film of the organic substance and/or sulfur compound on the surface. As discussed above, the Federal Circuit has stated that "rejections on obviousness cannot be sustained with mere conclusory statements; instead, there must be some articulated reasoning with some rational underpinning to support the legal conclusion of obviousness." *In re Kahn*, 441 F.3d 977, 988, 78 USPQ2d 1329, 1336 (Fed. Cir. 2006). Appellants respectfully submit that the Examiner has not provided any motivation for combining Mishima with Barstad and Hongo besides the conclusory statement that it would be desirable to provide a thin film of the organic substance. The Examiner has not provided any reasoning as to why one skilled in the art would be motivated to combine the teachings in asserted manner and has not demonstrated that the combination of references would render obvious the invention claimed by Appellants.

Furthermore, Appellants respectfully disagree that Barstad taken with Hongo can be combined with Mishima in the manner indicated by the Examiner to show that the pretreatment solution described and claimed by Appellants would have been obvious in view of the prior art.

Firstly, the first plating solution of Hongo and the pretreatment solution of Mishima are very different from each other. Hongo utilizes a first plating solution that comprises 5-100 g/l of copper sulfate and 100-250 g/l of sulfuric acid to provide a composition superior in throwing power. In contrast, Mishima is using an organic pretreatment solution containing 5 mg/l of the sulfur containing organic acid (see e.g., col. 11, line 45 – sulfur compound concentration: 5 mg/l = 24 $\mu\text{mol/l}$) and further discloses that it is effective that the sulfur compound has a concentration ranging from 0.1 $\mu\text{mol/l}$ to 70 $\mu\text{mol/l}$ in the processing solution.

Thus, the Examiner is proposing that it would be obvious to substitute a sulfur compound used in a concentration of 0.1 $\mu\text{mol/l}$ to 70 $\mu\text{mol/l}$ as described in Mishima for the sulfuric acid used at a concentration of 100-250 g/l in the plating solution of Hongo without providing any reasoning as to why one skilled in the art of electroplating would

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desire to do. Appellants respectfully submit that one skilled in the art would know that sulfuric acid is widely used in the industry due to it being widely available and relatively inexpensive as well as the predictable results one would expect to achieve by using a mineral acid that has been used in electrolytic plating solutions for decades. Therefore, there is no teaching or suggestion in either reference to demonstrate why one skilled in the art would be motivated to substitute the minute quantity of the additive in the pretreatment solution of Mishima for the large quantity of sulfuric acid in the first plating solution of Hongo. For all of these reasons, one skilled in the art would not be motivated to substitute the organic sulfur containing compound of Mishima that is used in a very small concentration in the pretreatment solution for the sulfuric acid that is used at a very large concentration in the first plating solution of Hongo.

Furthermore, the "pretreatment solution" of Hongo is an electrolytic plating solution. In contrast, the pretreatment solution of Mishima is not applied electrolytically. As described for example at column 2, lines 36-50, Mishima discloses that the substrate is brought into contact with the processing solution before the substrate is plated and/or while the substrate is being plated. The phrase *"while the substrate is being plated"* means while the plated film is being deposited in a stage before the thickness of the plated film reaches a final target thickness for the plated film. In addition, the examples also demonstrate that the pretreatment solution is not being applied electrolytically. Appellants respectfully submit that the differences in the composition of the plating solutions of Hongo and Mishima as well as the difference in application (i.e., electrolytic plating in Hongo versus non-electrolytic process in Mishima) further demonstrate that one skilled in the art would not be motivated to combine Barstad with Hongo and Mishima in the manner indicated by the Examiner.

Next, the Examiner concludes that it also would have been obvious to one of ordinary skill in the art to modify the plating solution of Barstad to include an aldehyde as a brightener as disclosed by Sonoda because the application of brighteners is a known technique that would yield the predictable result of a brighter looking surface.

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Appellants respectfully disagree.

Firstly, Barstad already discloses preferred brightener compounds that contain one or more sulfur atoms, and typically without any nitrogen atoms and a molecular weight of about 1000 or less. The Examiner has not provided any teaching or suggestion in either reference to suggest that it would be obvious to substitute the aldehyde for the preferred brighteners disclosed in Barstad. Furthermore, the plating composition of Sonoda is a tin-silver-copper plating solution which deposits tin as the major constituent and silver and copper in much lesser quantities. Therefore, there is also no suggestion as to whether the aldehydes, which are usable as brighteners for tin-silver-copper alloy plating described in Sonoda would also be usable as brighteners in plating solutions that contain mainly copper as described and claimed in Barstad, alone or in combination with Hongo and Mishima. Thus, Appellants respectfully submit that it cannot be shown that one skilled in the art would be motivated to use an aldehyde, as disclosed in Sonoda, as a brightener in the composition described by Barstad.

The Examiner further concludes that it would have been obvious to one of ordinary skill in the art to provide the alkane sulfonic acids in a concentration of 40 to 200 g/l as disclosed by Proell as it is desirable to maintain free alkanesulfonic acid in the copper plating baths.

Appellants respectfully disagree.

The Examiner points to paragraph [0032] to shown that an alkane sulfonic acid such as a dialkyl aminothiox-methyl-thioalkanesulfonic acid can be used in the composition of the invention and then concludes that this sulfonic acid composition can be used at a concentration with the range claimed by Appellants because Proell teaches that it is desirable in some compositions to maintain free alkane sulfonic acid in the copper plating baths. Appellants note that Barstad discloses that the dialkyl amino-thiox-

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methyl-thioalkane sulfonic acid is an example of a suitable brightener and discloses that the brightener concentration may range from about 20 to about 200 mg per liter of plating solution. Appellants respectfully submit that one skilled in the art at the time the invention was made would not have been motivated to use a concentration of the dialkyl amino-thiox-methyl-thioalkane sulfonic acid in Barstad of 5 to 50 grams per liter, as suggested by Proell, because this would render the Barstad plating bath unsuitable for its purpose as the concentration of brightener would thus be present in the composition would be much higher and would substantially change the nature of the composition of Barstad, alone or in combination with Hongo and Mishima, and would not produce a desired result.

Appellants note also that Barstad discloses the use of methane sulfonic acid for the acidic electrolyte in the composition of their invention (see ¶[0023]. As seen from the examples, the acidic electrolyte is generally used at a concentration of 175-225 grams/liter (see examples 1-3). This further demonstrates that it would be not be obvious the use the concentration of alkane sulfonic acid suggested by Proell in the composition of Barstad because Barstad already discloses a greater quantity of methane sulfonic acid (e.g., acidic electrolyte) and so already uses an amount of free alkane acid in the copper plating bath. This is further evidenced by the teachings of Hongo in which Hongo discloses that a low concentration of copper sulfate and a high concentration of sulfuric acid is superior in throwing power and coating uniformity and a plating solution having a high concentration of copper sulfate and a low concentration of sulfuric acid is superior in leveling ability. Thus, Hongo clearly demonstrates that the concentration of sulfuric acid, which is a similar acidic electrolyte to methane sulfonic acid, in the composition as well as the concentration of copper sulfate can change the attributes of the coating and thus provides sufficient reasons as to why one would not be motivated to combine Proell with Barstad, alone or in combination with Sonoda, Hongo, and Mishima to achieve the claimed invention. For all of these reasons, it is respectfully submitted that Proell is not combinable with Barstad in the manner suggested by the Examiner and thus the

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combination of Barstad, alone or in combination with Sonoda, Hongo, Mishima, and Proell does not render obvious the claimed invention.

For all of these reasons, claims 1-3 and 7-9 are believed to be patentable over the prior art of record and the rejection of claims 1-3 and 7-9 as being unpatentable over Barstad in view of Sonoda, Hongo, Proell and Mishima should be withdrawn.

b. Rejection of Claims 5, 6, and 10 under 35 U.S.C. §103(a) over Barstad in view of Sonoda, Hongo, Proell and Mishima and further in view of Nishihama and Yang:

With regards, to claims 5, 6 and 10, the Examiner asserts that the combination of Barstad, Sonoda, Hongo, Proell and Mishima discloses a process for electrolytically plating copper but does not specifically disclose that the brightener additive comprises disodium bis (3-sulfopropyl) disulfide and that the leveler additive comprises tetrapolypropoxy-ethoxy ethylenediamine sulfosuccinic ester sodium salt. The Examiner uses Nishima and Yang to cure the deficiencies of Barstad, Sonoda, Hongo, Proell and Mishima.

Firstly, claims 1-3 and 7-9 are believed to be allowable over the prior art of record for the reasons provided above. Therefore, claims 5, 6 and 10, which depend from these claims are also believed to be allowable over the prior art of record and the rejection of claims 5, 6, and 10 as being unpatentable over Barstad in view of Sonoda, Hongo, Proell and Mishima and further in view of Nishima and Yang should be withdrawn.

In addition, the Examiner asserts that it would be obvious to include tetrapolypropoxy-ethoxy ethylenediamine sulfosuccinic ester sodium salt in the composition described by Barstad in view of Sonoda, Mishima, Hongo and Proell to improve the appearance and physical properties during copper electroplating. Appellants respectfully disagree.

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Appellants respectfully submit that Barstad already discloses various leveling compositions that are usable in the compositions of their invention to improve the appearance of the copper plating. The Examiner has not provided any reasons why one skilled in the art would have substituted the leveling composition of Nishima for the leveling compositions described in Barstad. If the Examiner is suggesting that it would be obvious to simply add the leveling composition described in Nishima to the composition of Barstad, the Examiner has not provided any motivation as to why one skilled in the art would have added a second leveling composition to the composition of Barstad, alone or in combination with Sonoda, Mishima, Hongo and Proell. The Examiner has simply concluded that because Nishima discloses the use of the tetrapolypropoly-ethoxy ethylenediamine sulfosuccinic ester sodium salt as an additive that this additive can be added to the composition of Barstad in view of Sonoda, Mishima, Hongo and Proell but has not provided any reasons why one skilled in the art would have been motivated to do so, especially since Barstad already describes the use of other leveling compounds in the composition of their invention for the same purpose. As discussed above, the Federal Circuit has stated that "rejections on obviousness cannot be sustained with mere conclusory statements; instead, there must be some articulated reasoning with some rational underpinning to support the legal conclusion of obviousness." *In re Kahn*, 441 F.3d 977, 988, 78 USPQ2d 1329, 1336 (Fed. Cir. 2006). This has not been done in this instance.

Therefore, Appellants respectfully submit that claims 5, 6 and 10 are also allowable over the prior art of record and rejection of these claims on the basis that the claims are unpatentable over Barstad in view of Sonoda, Mishima, Hongo and Proell and further in view of Yang and Nishima should be withdrawn.

CONCLUSION

The Examiner's rejection of claims 1-3 and 5-10 should be reversed for the following reasons:

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- 1) Barstad in view of Sonoda, Hongo, Proell and Mishima do not describe or suggest all of the features of the claimed invention because:
- a) Barstad only discloses a process for electrolytically plating copper on a surface using a copper plating solution comprising copper ions and an acidic electrolyte and applying plating current such that copper is plated on the surface.
 - b) Barstad does not describe a pretreatment solution, but the Examiner uses a combination of Hongo and Mishima to assert that it would be obvious to modify Barstad to use a pretreatment solution. Hongo uses two different electrolytic plating solutions to provide different properties and the first plating solution is substantially similar to the plating solution already described in Barstad. The Examiner has not shown that there would be any desirability to modify Barstad to use this first plating solution. Furthermore, the pretreatment solution of Mishima is not applied electrolytically and is also chemically very different from the first electroplating solution of Hongo and the Examiner has not provided any teaching or suggestion as to why one skilled in the art would be motivated to combine such different treatment solutions that are applied in very different ways. Therefore, the combination of Hongo and Mishima does not describe or suggest a pretreatment solution that can be combined with Barstad to anticipate or render obvious the claims of the present invention.
 - c) Barstad teaches brighteners and there would be no reason for one to look to Sonoda, which is directed to tin alloy plating for a different brightener for use in the composition of Barstad. The Examiner has provided no teaching or suggestion as to the desirability of substituting brighteners from a different type of electroplating for the preferred brighteners described in Barstad. Thus, the combination of Barstad with Sonoda (and also in combination with Hongo and Mishima) does not anticipate or render obvious the claims of the present invention.

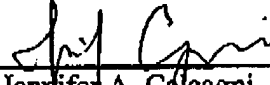
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- d) Proell also cannot be combined with Barstad, Hongo, Mishima and Sonoda in the manner suggested by the Examiner and does not cure any of the deficiencies described above.
- 2) Neither Yang nor Nishima cure any of the deficiencies of Barstad, Hongo, Mishima, Sonoda and Proell and thus the combination of these references also does not anticipate or render obvious all of the features of the claims of the present invention.

For all the foregoing reasons, the references cited by the Examiner are insufficient to render the pending claims anticipated and/or obvious. As a result, it is believed that the rejections proposed by the Examiner are inappropriate, should be overturned, and that this application should pass to allowance. Such action is earnestly sought.

Respectfully submitted,


Jennifer A. Calcagni, Reg. 50,207
Carmody & Torrance LLP
50 Leavenworth Street
P. O. Box 1110
Waterbury, CT 06721-1110
(203) 575-2648

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CLAIM APPENDIX

1. A process for electrolytically plating copper on a surface, said process comprising:

a) contacting the surface with a pre-treatment solution comprising an aqueous solution comprising a sulfur containing organic compound and from about 0.01 to about 5 g/l of copper ions; and then

b) contacting said surface as a cathode with an electrolytic copper plating solution comprising (i) copper ions, (ii) from about 40 to about 200 g/l of an alkane sulfonic acid; (iii) chloride ions, and (iv) an aldehyde or ketone compound; and applying a plating current such that copper is plated on the surface;

wherein the pH of the pre-treatment solution is in the range of 1 to 3.5.

2. A process according to claim 1 wherein the sulfur containing organic compound comprises a sulfonate group or a sulfonic acid group.

3. A process according to claim 1 wherein the plating solution also comprises at least one additive selected from the group consisting of brightener additives, leveler additives, surfactants and wetters.

5. A process according to claim 3 wherein the brightener additives comprise disodium bis(3-sulfopropyl)disulfide and the leveler additives comprise tetrapolypropoxy-ethoxy ethylenediamine sulfosuccinic ester sodium salt.

6. A process according to any one of claim 1, 3, or 5, wherein the sulfur containing organic compound comprises disodium bis(3-sulfopropyl)disulfide.

7. A process according to claim 1 wherein the plating current is a constant direct current.

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8. A process according to any one of claim 1, 2, 3, or 5, wherein the plating current varies over time.

9. A process according to claim 1 wherein the electrical polarity of the cathode is reversed periodically.

10. A process according to claim 1 wherein: a) the pre-treatment solution comprises copper ions and disodium bis(3-sulfopropyl)disulfide; and b) the plating solution comprises disodium bis(3-sulfopropyl)disulfide and tetrapolypropoxy ethoxy ethylene diamine sulfosuccinic ester sodium salt.

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EVIDENCE APPENDIX

None

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RELATED PROCEEDINGS APPENDIX

None